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A profile is presented of a high school designed so that its academic spaces are completely adaptable--changes in the program can be quickly reflected in the building through the easy rearrangement of partitions. The profile emphasizes why the school was designed as it was and how it was designed and built. Schematics and photographs are included along with an evaluation of the school. (FS)

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Profiles of Significant Schools

HILLSDALE HIGH SCHOOL
SAN MATEO, CALIFORNIA

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Research by
School Planning Laboratory
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Stanford, California

EF 000873

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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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New Ideas for School Design

Communities all over the United States are building new schools. But not every administrator, architect, and school board member can tour the country looking at the latest developments in school planning and design.

To provide people engaged in school building with a detailed knowledge of the most adventurous new schools, EFL is publishing this series of reports, entitled Profiles of Significant Schools. The reports attempt to show two things: why the school was designed as it was, and how it was designed and built. In order to do this, the Profiles will explore the educational program (which may in itself be unusual), any architectural innovations the design may contain, and any special features that may be of interest, such as air conditioning, flexibility or open planning.

These are Profiles of individual schools, built in individual communities, to house individual programs. These schools will not necessarily serve ideally in other communities, but many of the ideas incorporated in them are applicable in many places. We hope that people involved in school planning and building will find the ideas stimulating and useful.

We would appreciate your reactions to the series as well as suggestions for making future Profiles more useful.

School:	Hillsdale High School San Mateo, California
Opened:	September, 1955
Grades:	9 - 12
Design Capacity:	1,500
Present Enrollment:	1,600
Architects:	John Lyon Reid & Partners San Francisco, California Partner in Charge: Burton L. Rockwell
Superintendent:	Thomas F. Reynolds
Principal:	Ray G. Allee
Educational Consultants:	James D. MacConnell William R. Odell

San Mateo, a commuter suburb 17 miles south of San Francisco, is primarily residential but has some light industry as well. It has a population of 70,000, mostly upper middle class professional and managerial executive families. About 60 per cent of Hillsdale's students go on to college.

Hillsdale High School, San Mateo, California

Hillsdale High School in San Mateo, California, was one of the first high schools in the country designed to accommodate change.

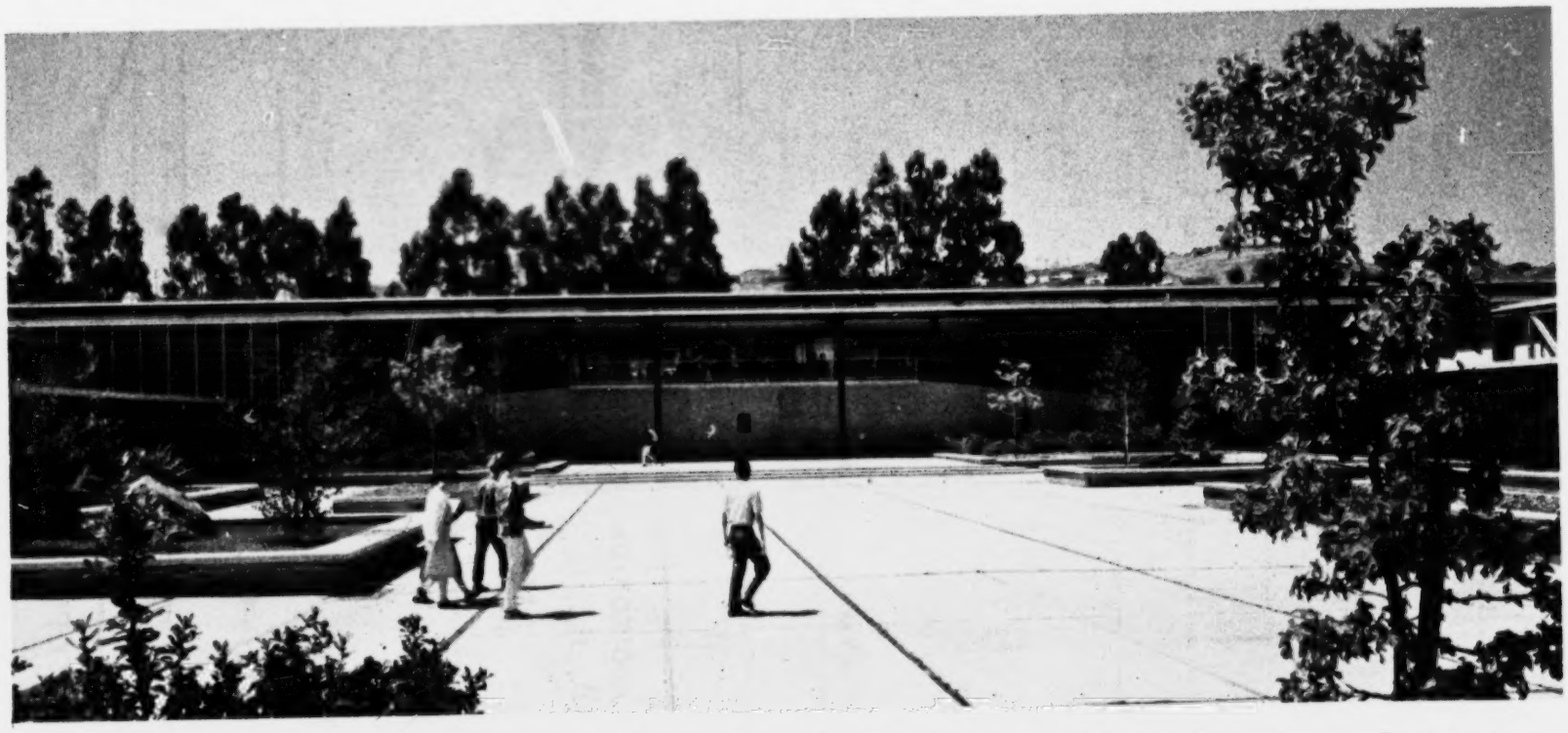
The academic spaces at Hillsdale are completely adaptable - changes in the program can be quickly reflected in the building through the easy rearrangement of partitions. There is no need for extensive and costly remodeling, and Hillsdale will not become obsolete before it has more than repayed its original cost in full service.

Since the school was completed in 1955, the concept of adaptable space pioneered at Hillsdale has influenced the design of schools all over the country.

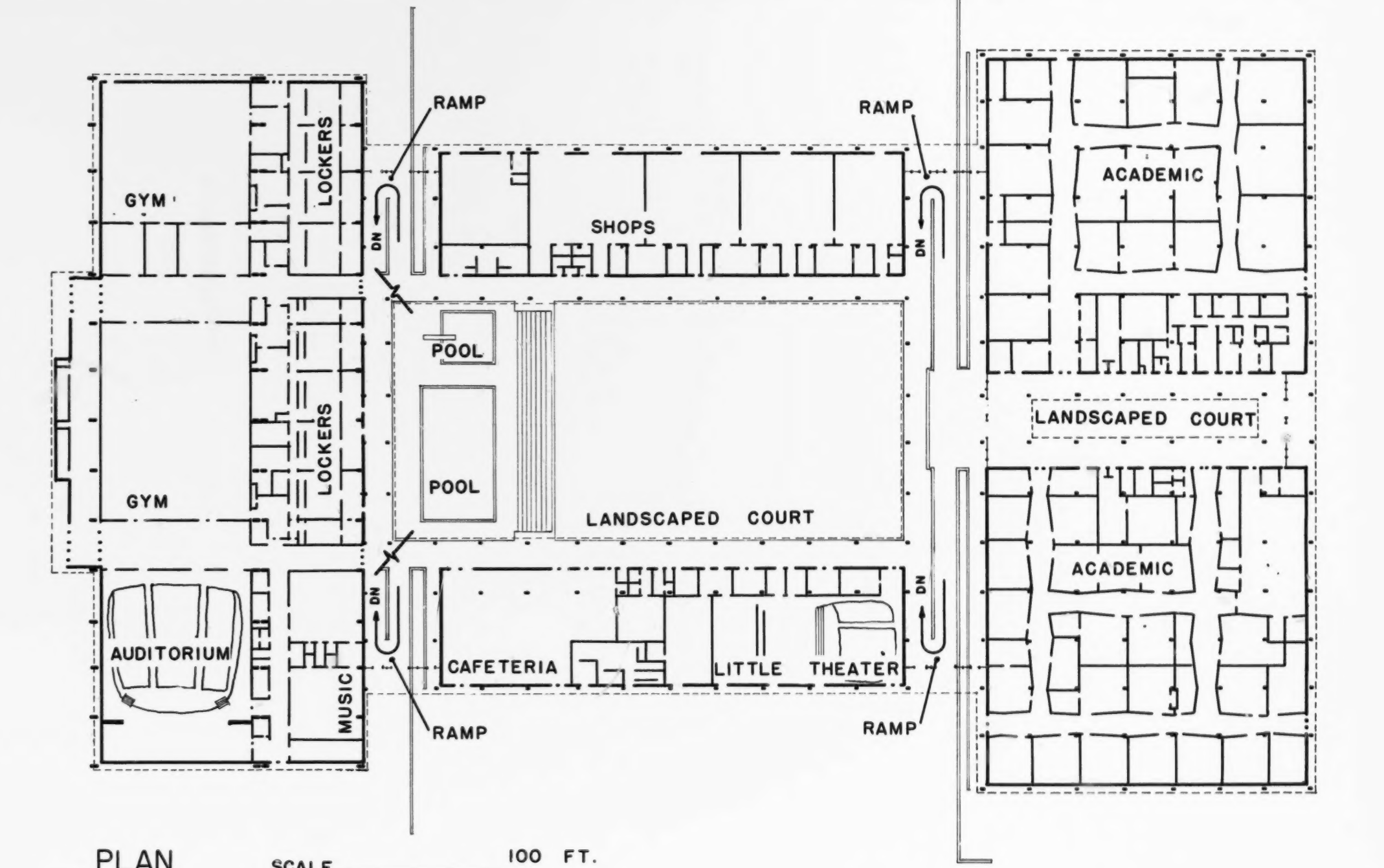
General Plan

The school is divided into three levels to conform to the gradual change in elevation of its 35 acres. Each level houses a particular part of the school's program.

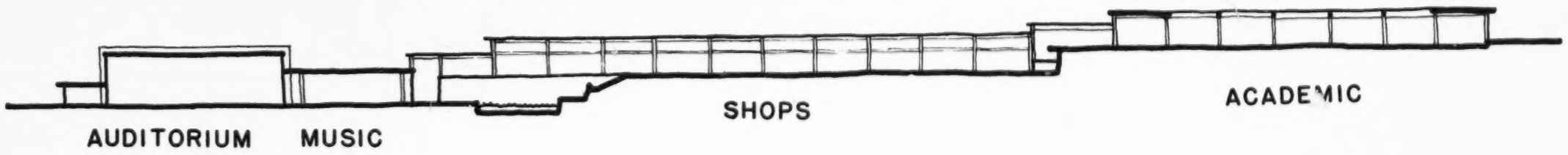
Further separation occurs due to the arrangement of the various sections of the school around a large central court. Activities such as shop, music, arts and crafts, and physical education do not interfere with the quieter studies going on in the academic wing.



Students move in the court from level to level through covered ramps.



PLAN SCALE 100 FT.



SECTION

Within the academic wing, the separation of activity is carried a step further. English, foreign languages, and social studies are housed at one end of the wing while the commercial courses and the science laboratories are situated at the other end.

The entrance court separates the two sections of the academic wing.

Adaptable Academic Space

The importance of Hillsdale lies in the adaptable spaces of its academic wing.

As the school's chief designer, John Lyon Reid, has put it, "Our years of working with educators have resulted in the belief that a school building must not stand in the way of program changes

and educational progress, that the building must be ready to adapt itself not only to minor but to major program changes. We believe that total flexibility - or as close to that as possible - is a necessary attribute of the secondary school building of today, facing as it does, the problems of a growing, changing, improving educational philosophy."*

In order to make the academic spaces at Hillsdale adaptable to change, the architects adopted the theory of loft space used in the design of many contemporary industrial plants and offices. The aim of a loft is to obtain a broad area of enclosed space that is free of permanent interior walls or other obstructions that would interfere with the flexible arrangement and use of the enclosed area.

At Hillsdale, a structural steel frame rests on concrete footings. The floor - a concrete slab - is poured on grade. The steel frame is enclosed with a steel roof deck covered with tar and gravel and an exterior curtain wall of glare-reducing glass windows and insulated asbestos cement board sandwich panels.

The academic loft used a 28 foot square repetitive bay as its basic building block. Except for columns, the loft space is unobstructed.

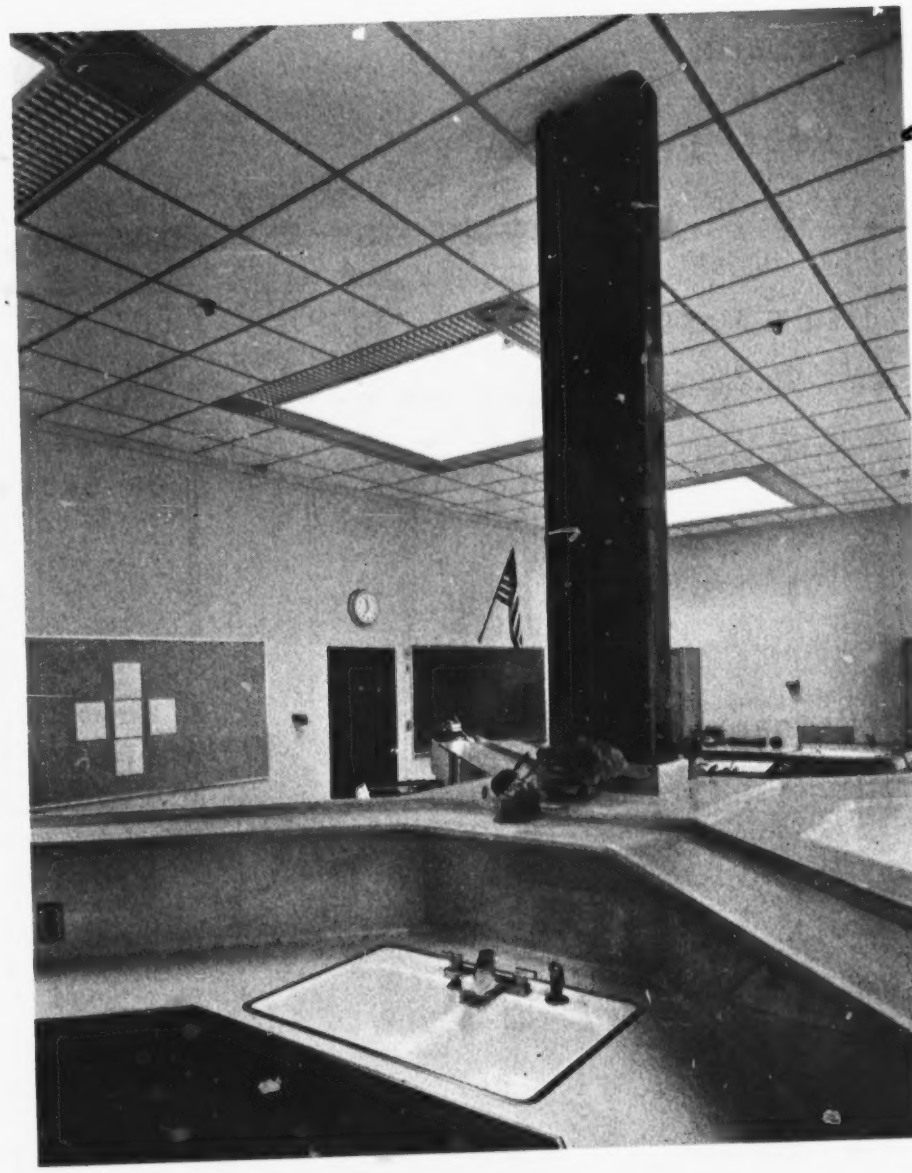
* John Lyon Reid, "Two Loft Schools; New Instruments of Education," Architectural Record, February,1960.

The mechanical facilities are tucked away in the ceiling or the floor. The resulting free interior space is equipped with movable partitions and can be arranged to serve whatever educational purposes the program may dictate.

The Mechanical Facilities

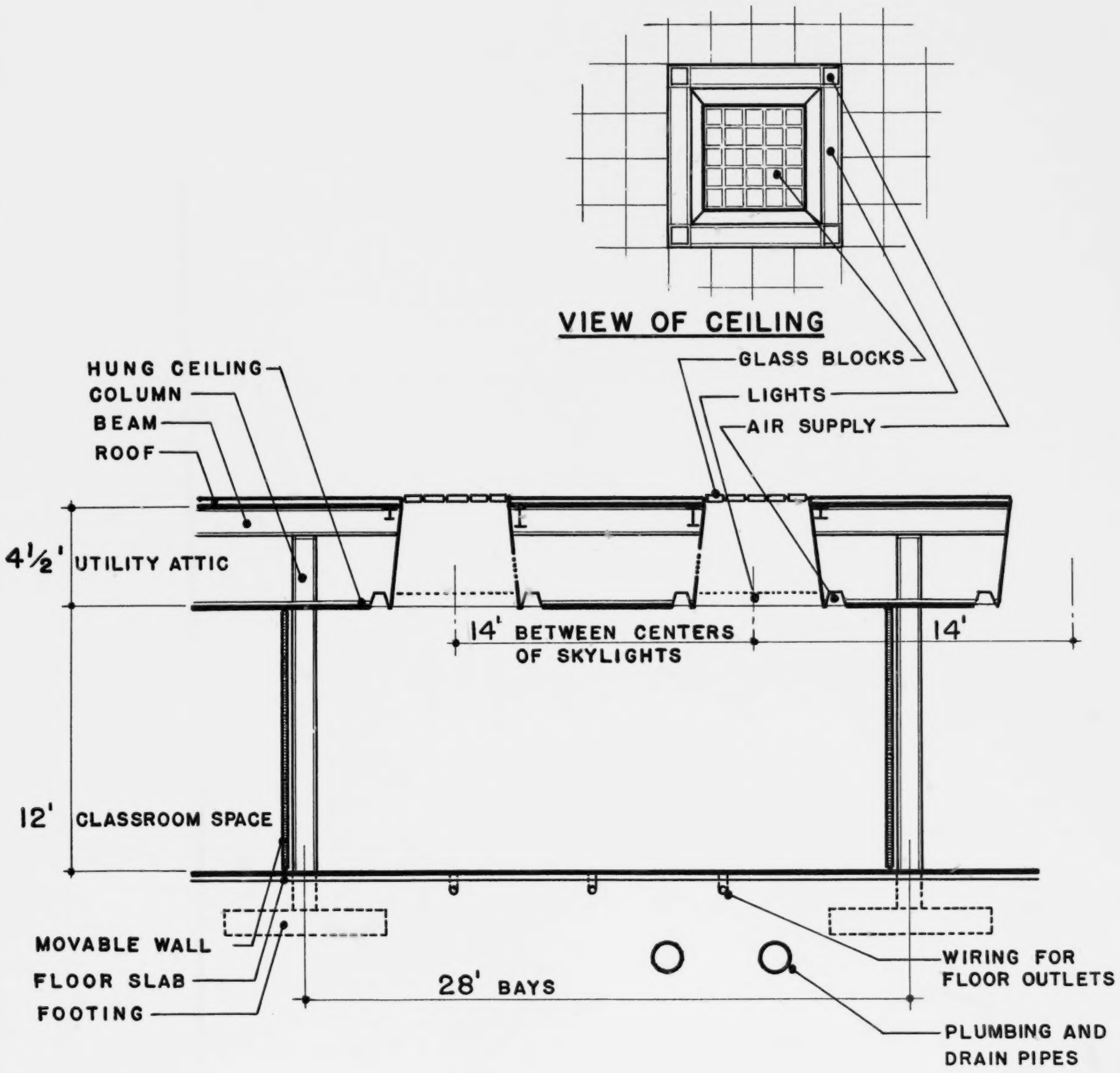
Between the ceiling and the roof at Hillsdale there is a 4½ foot utility attic containing the heating and ventilating ducts, water pipes, gas lines, and electrical wiring for the lights.

Water for additional plumbing such as sinks can be brought down from the overhead water pipes along any column. Similarly, gas for ranges can be brought down from the gas pipes at any column. The utility attic is covered at the bottom by an aluminum grid to which two foot square panels of fireproof, sound-absorbent tile are attached to form a ceiling.



A home economics room draws its gas, water and electricity from the utility attic by running lines down one of the columns.

Plumbing waste lines run beneath the concrete slab floor and are brought up and capped off at floor level at the base of alternate columns. If a sink needs to be installed at any column it is connected to the overhead water supply and to the underground waste lines.



In addition to electrical wiring in the attic, a complete electrical conduit system is contained in the slab beneath the asphalt tile flooring. Each 28 by 28 foot bay has 16 floor boxes set in the concrete and covered by the asphalt tile. The position of each of these boxes is marked by a specially colored tile. To draw power from any of these boxes, the maintenance men need only to lift the tile and connect an outlet.

Light is supplied to the academic space by a special system of top lighting - 6 by 6 foot light wells set at regular intervals in the roof and extending down through the utility attic and ceiling. These wells are spaced 14 feet apart, center to center in all directions, thus providing four sources of natural light for every bay. Each light well is capped by an aluminum grid holding 36 prismatic glass blocks. These prismatic blocks allow only north and low angle south light to enter the well, shutting out glaring overhead light and the heat it would produce in the classrooms below.

To supplement the natural light and to maintain a constant level of illumination, fluorescent lights are placed in the ceiling around the edge of each light well.

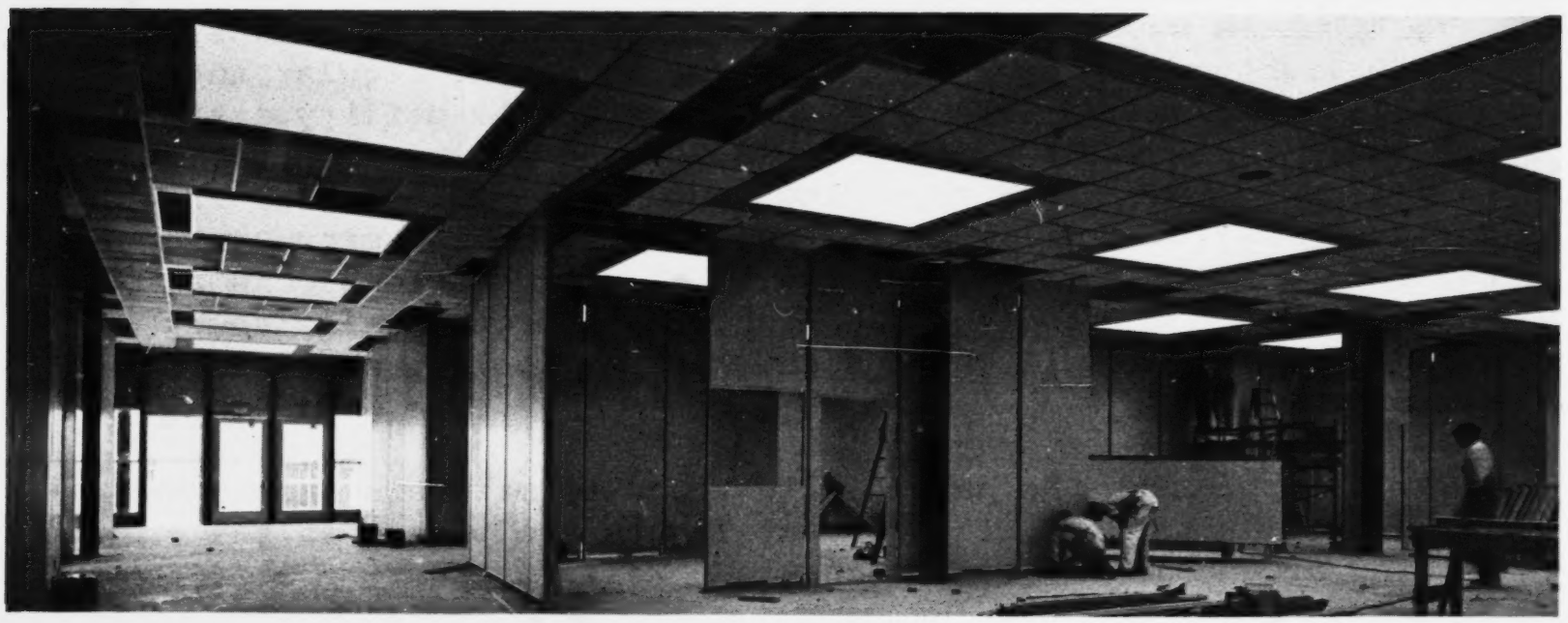
Both heated and fresh air are brought to each bay through separate duct systems in the utility attic. A thermostatically controlled damper in each bay determines the needed mixture of heated and fresh air and sends the proper mixture into the classrooms through 12 inch square grilles located at the four corners of each light well. In warm weather or when the school is full of people, only unheated air is brought into the bays.

Thus, with all utilities and air supply equipment out of the way, the educational space can be arranged to suit the school's program rather than the school's mechanical system.

Movable Walls

For Hillsdale's system of movable walls the architects selected a system of standard steel panels filled with insulating mineral wool and covered with baked enamel finish. These panels -

interchangeable and reusable - are bolted into the aluminum ceiling grid to which the acoustical ceiling tile is attached. A panel can be removed or put into place by detaching a square of tile, unbolting or bolting the panel, and replacing the tile. This system makes the paneling at Hillsdale completely independent of the interior columns, thus insuring a high degree of flexibility in the academic wing.



Wall panels at Hillsdale can be put up or taken down in a simple operation.

The panels at Hillsdale are arranged in a zigzag pattern to provide a more pleasant view, to scatter reverberating sound and to provide additional width near classroom exits.

Interior Spaces

"Hillsdale's loft plan," according to architect Reid, "freed interior space of permanent partitions, making its use completely adaptable to any changes that might occur in the curriculum. The loft plan ... permits the maximum flexibility and greatest opportunity for rearrangement, and at the same time imposes its own vexing problems on the architect. During the design of Hillsdale, we found that in accepting the loft concept we also accepted the inevitability of dealing with interior spaces.

A wholly interior classroom.

"To make these spaces at least acceptable as room was a particular challenge to us. We thought, at that time, that in going to the interior classroom - which we had to do if we were to achieve the total flexibility we had been directed to provide - we were foregoing something educationally desirable: the outside classroom with its windows opening on the surrounding environment. But after Hillsdale had been in use for several years we found, to our considerable surprise and gratification, that a majority of the teachers preferred inside rooms to view rooms. During planning conferences (for Mills High School, a later variation on Hillsdale's loft plan), some of the teachers requested that all rooms ... be the so-called inside rooms. But both types of rooms have their special virtues, and so our decision was to provide both at Mills."*

Not all observers of Hillsdale agree that the architects have solved the enclosed classroom problem. Some visitors to the school maintain that these rooms do promote a feeling of claustrophobia and are unpleasant to be in.

Nonacademic Spaces

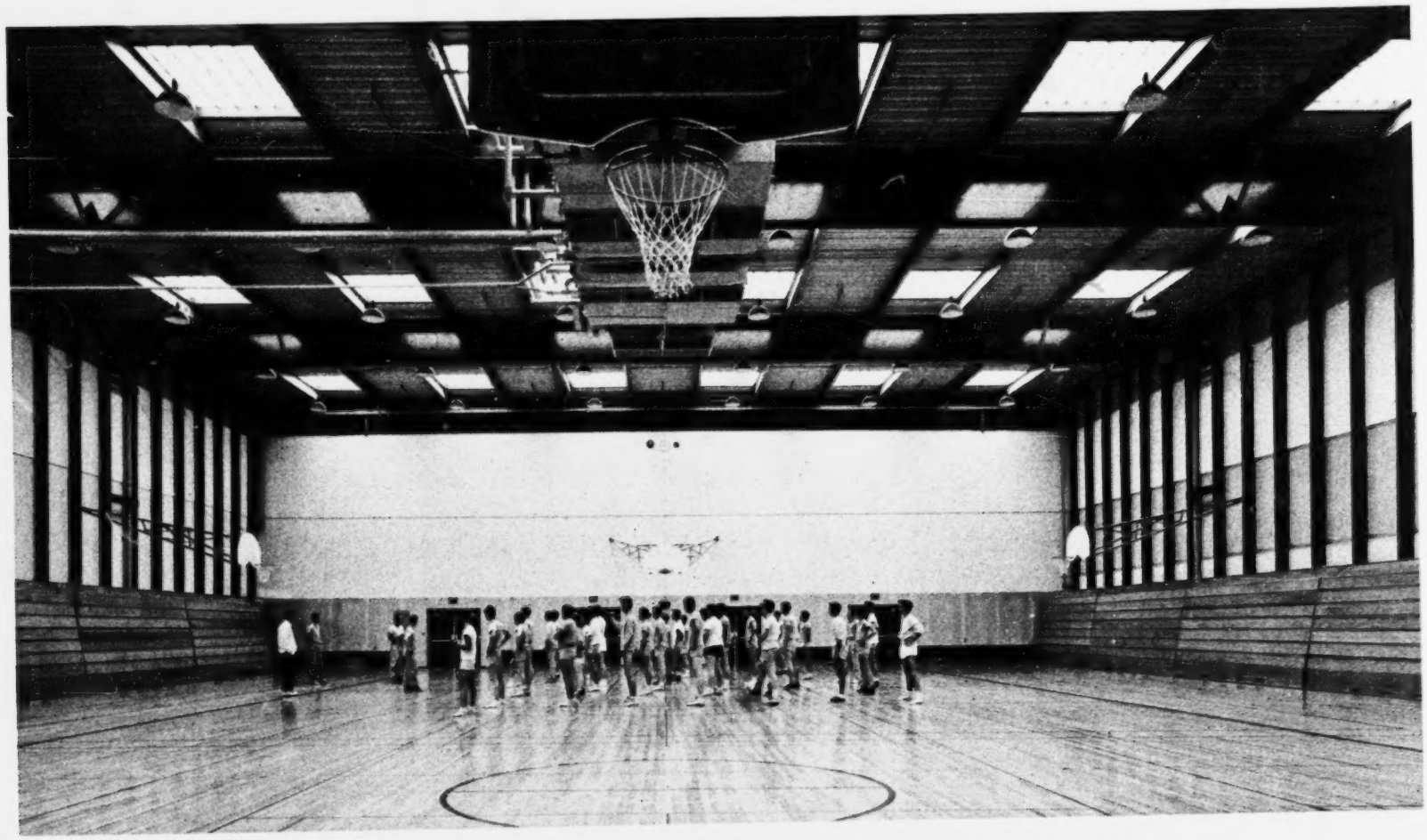
Although the academic wings at Hillsdale are the school's most flexible spaces, there are no load bearing walls anywhere in the school. The nonacademic areas are constructed on the same 28 by 28 foot bay and are top lighted, but they do not have utility attics or movable panels.

The auditorium seating 1,000 and the little theater seating 300 are essentially large rooms with sloping floors built by scooping out the earth and pouring a cement slab onto the incline. The stage and the walkways around the edge of the rooms remain at ground level.

The Uses of Adaptable Space.

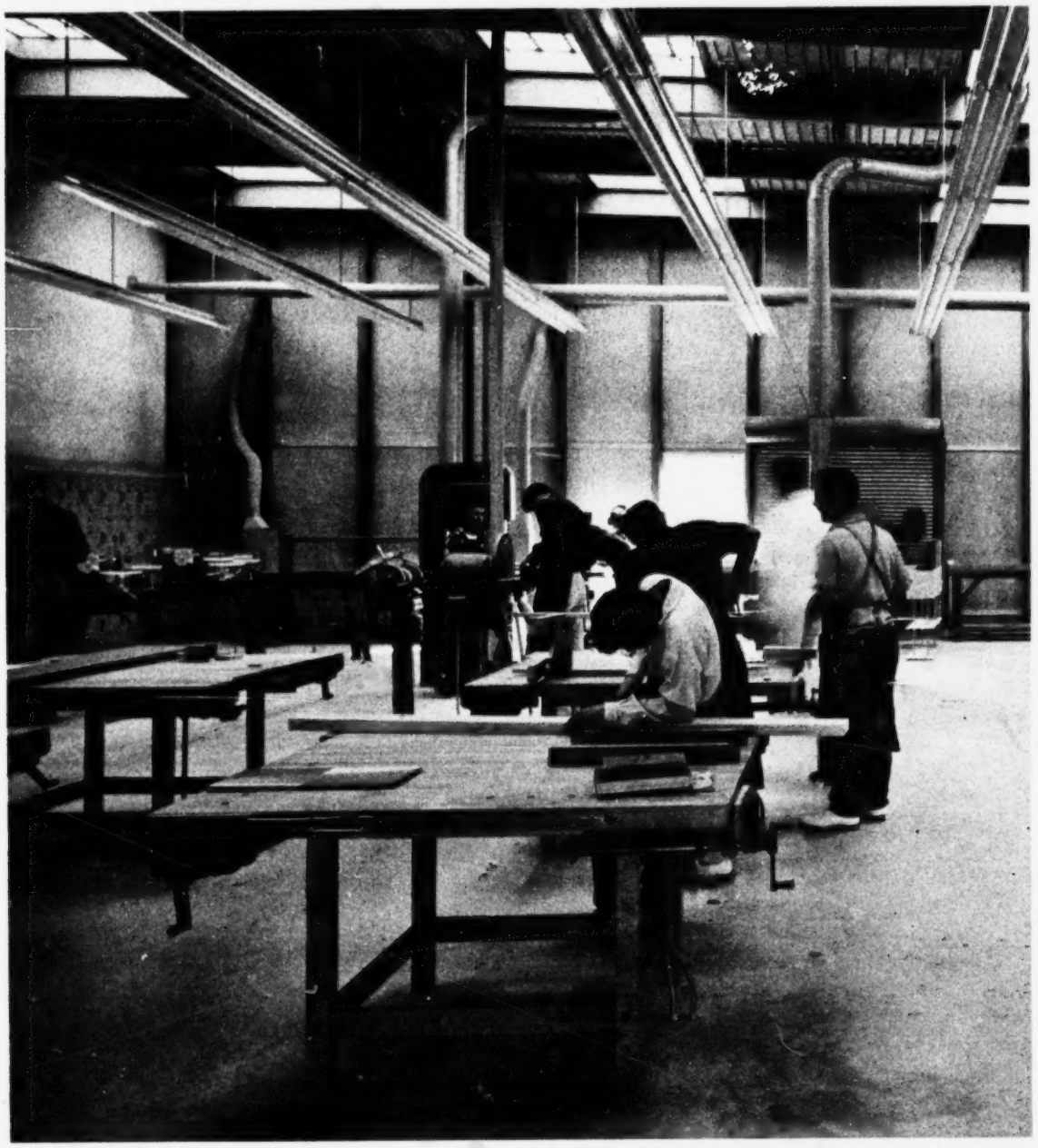
As this report is written, Hillsdale's adaptable academic spaces have not as yet been put to any large amount of adaptable use. Since the school opened in 1955, six minor changes in the arrangement of the walls have been made, mainly to create more classrooms to house a larger school population.

* John Lyon Reid, "Two Loft Schools: New Instruments of Education," Architectural Record, February, 1960.



The two gymnasiums, one for girls, this one for boys, are constructed with exposed steel frames. The exposed steel concept was adopted by the architects in part for reasons of economy but also because they favored it aesthetically.

The cafeteria leaves not only the frame but also the heating and ventilating units exposed. The cafeteria is used also as a study hall.



In the shops, too the frame remains exposed. Because of the heavy concentration of academic students, the shops are not used as much as was expected. Loft space here would be a great asset.

The little theater seats 282, is economical, and uses the same exposed steel framing adopted elsewhere in the school.

Although the school is beginning to experiment with variable class sizes, the educational program has not as yet changed radically, nor has the interior arrangement of space.

What is important about Hillsdale's concept is free interior space. If the school should be reorganized, for instance, according to the plan recently advanced by the Trump Commission* Hillsdale could be adapted to the new arrangement easily and at a minimum cost.

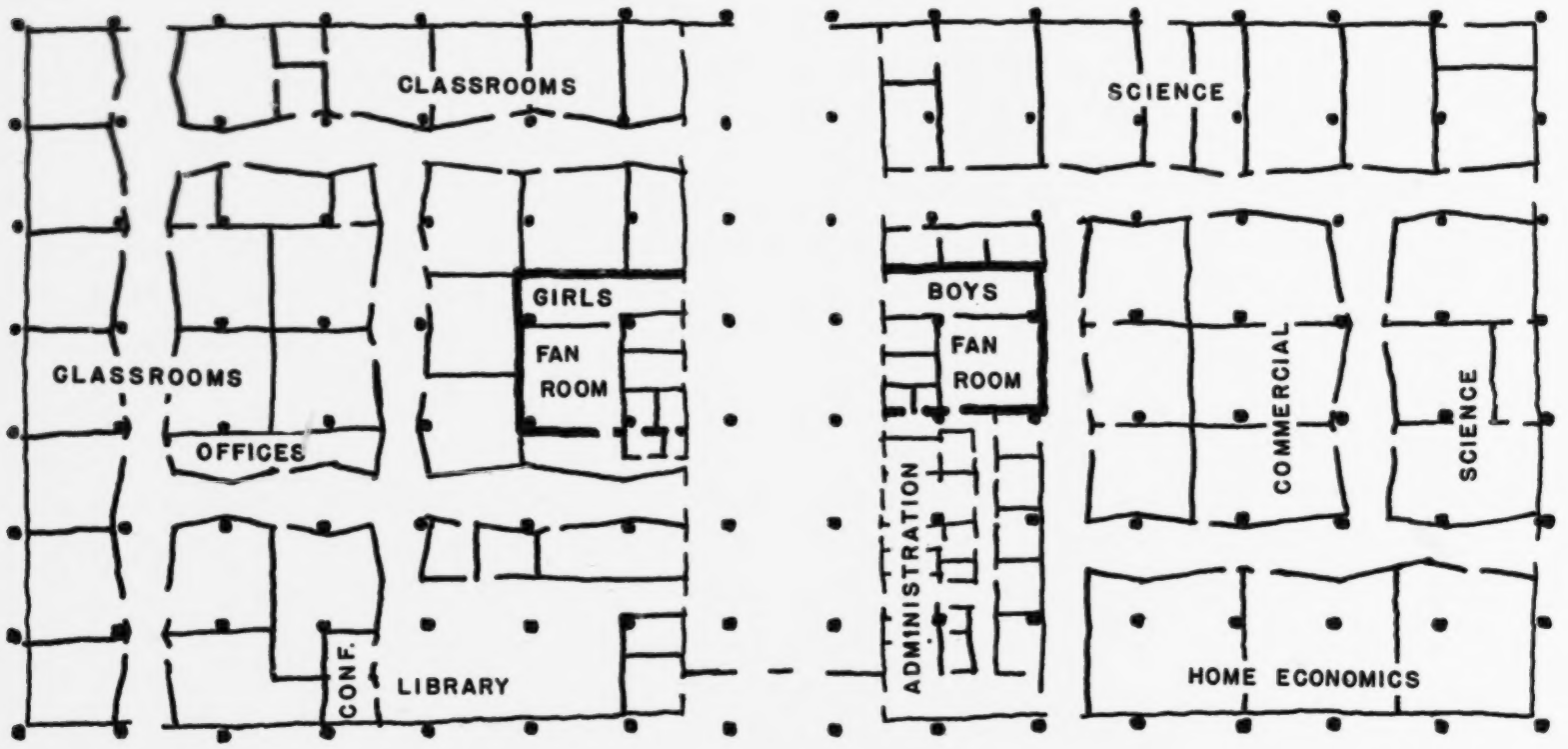
Under the Trump Plan, standard classes are eliminated in favor of teaching groups of varying sizes. A typical student might spend 40% of his time in large lecture groups of 100 or more students and about 20% of his time in small seminar groups of 12 to 25 students. The remaining 40% of his time would be spent in individual study, working on special projects or in conferences with teachers.

To accommodate this kind of program, a conventional high school would require major interior alterations to provide the proper large and small group rooms and individual study spaces. Hillsdale's interior partitions can easily and economically be shifted about to provide such spaces.

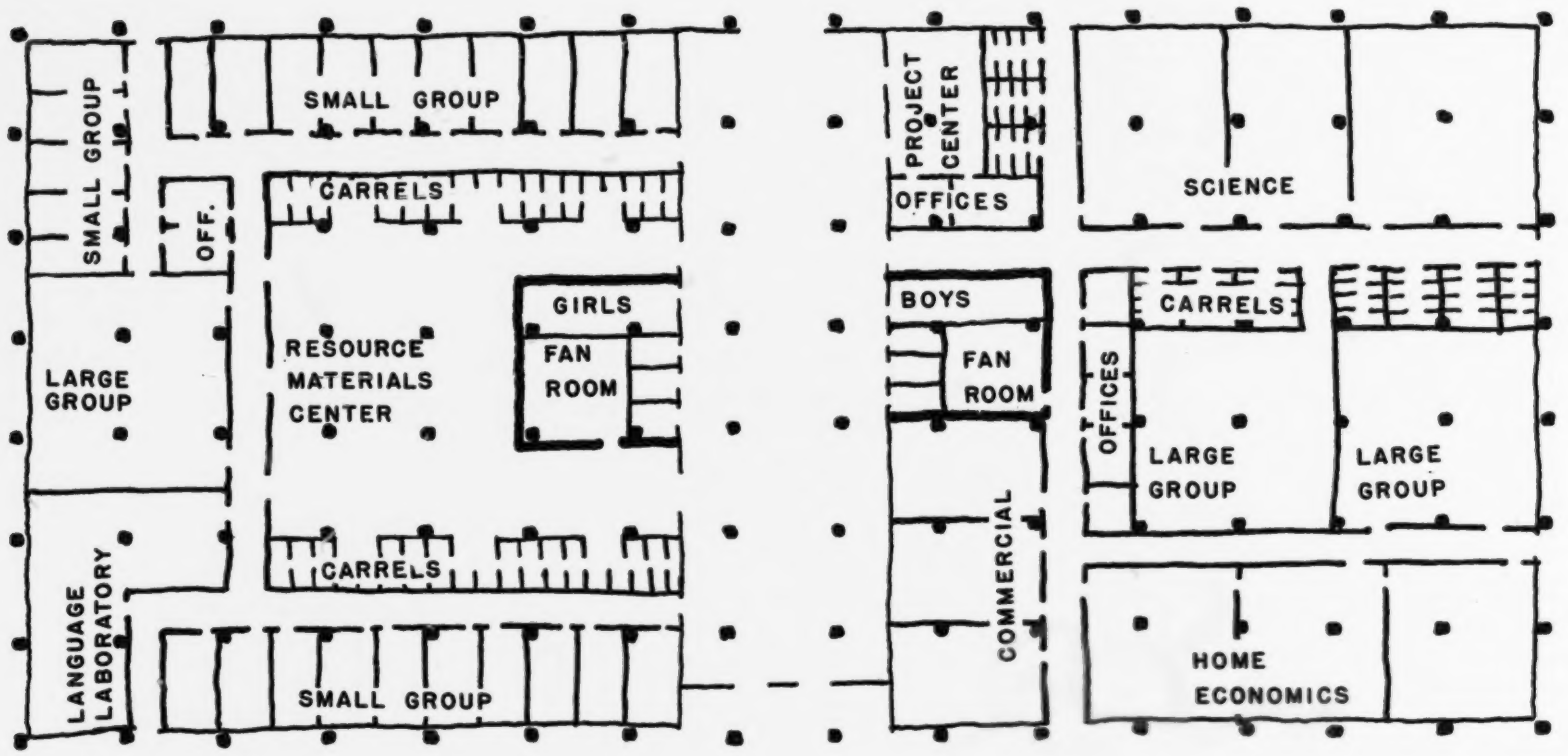
But no one can say with any certainty today what shape the program of tomorrow will assume. It may be the Trump Plan or some other program. But the high schools of the future will probably depend less and less on the conventional classroom. Nothing is certain in the world of school building except that the high school programs all over the country are involved in change. Only the most extravagant school system can afford to build a school today without making certain that it is prepared to accommodate whatever changes are coming.

Hillsdale's great virtue and its great eventual economy is that it is adaptable to change.

*Outlined in Images of the Future, A New Approach to the Secondary School., J. Lloyd Trump, Commission on the Experimental Study of the Utilization of Staff in the Secondary School, NASSP, Washington, D.C. Similar ideas were also expressed in High Schools Today and Tomorrow, Charles W. Bursch and John Lyon Reid; Reinhold Publishing Co. (1957).



The academic wing at Hillsdale as it looks now.



The academic wing arranged by the School Planning Laboratory, Stanford University, to accommodate a Trump-style program.

Cost

Hillsdale is an exactly average school in terms of school building costs in its area. A few of its special features such as top lighting, were costly because they were especially designed for this building. Since their design, these units have become standardized and, therefore, less expensive. The designers believe that any extra costs incurred by the loft planning of Hillsdale have been offset by the use of repetitive bays, by such design practices as leaving much of the school's frame exposed, and by a choice of high quality materials which will lower the cost of maintenance.

Hillsdale's real economies, however, will become evident as changes in educational programming force increasing numbers of alterations in existing high schools. While conventionally designed schools will require extensive and costly remodeling, Hillsdale and the other loft plan schools will be changing gradually and at minimum cost.

Hillsdale contains 225,779 square feet figuring all enclosed areas at full square footage and all open but roofed areas at one-half. The basic school cost $3,300,360. This includes the cost of building, all mechanical, ventilating, and electrical equipment, partitions, a complete sprinkling system (which has substantially lowered the cost of fire insurance) all shops, kitchen and athletic facilities, and all fixed casework. This figure does not include the communication system, theater and auditorium seats and equipment, movable furniture, or athletic equipment such as lockers, nor does it include the cost of the site, site grading and utilities, and the swimming pools. On this basis the cost per square foot is $14.62, and the cost per pupil $2,200.

Including built-in equipment and excavation, but not including the pool or the site, Hillsdale cost $3,561,400. The cost per square foot on this basis is $15.77 and the cost per pupil $2,374.

Construction Cost Breakdown

		Cost	Hillsdale % of Total*	Survey Average**
SITE				
Site Work (Excavation & grading)		97,000	3%	2%
BUILDING SHELL				
Footings, foundations & floors (Concrete, reinforcing steel)		405,900	11%	14%
Structural Frame (Steel)		373,300	10%	10%
Steel Roof Deck & Skylights		258,900	7%	3%
Roofing, insulation & flashing		89,056	3%	3%
Walls & partitions				
Masonry	27,700			
Metal partitions: interior	212,200			
exterior	129,900			
Glass, glazing & windows	36,000			
Doors & hollow metal	65,000			
Rough carpentry	18,200	489,000	14%	27%
FINISHING & EQUIPMENT				
Interior finishing (Tile, painting, plastering, finish carpentry, flooring, hardware & acoustic treatment)		358,900	10%	5%
Plumbing, heating, ventilating & cooling		798,500	22%	19%
Electrical wiring & fixtures		445,000	12%	9%
Miscellaneous equipment		195,200	5%	5%
OVERHEAD				
Contractor's job overhead (Bond, general conditions)		50,644	1%	3%
	Total Cost	$3,561,400		

* The figures are rounded off to the nearest per cent, and do not, therefore, total 100 per cent.

** Averages of 72 secondary schools surveyed by EFL.

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